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Dataset Information:

Funding_Info: NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial_Submission: 20160130
Revised_Submission: 20160130

Cruise Information:

Experiment Name: WS1117
Experiment Type: Research Cruise
Platform Type: Ship
Co2 Instrument Type: Equilibrator-IR or CRDS or GC

Cruise ID: 33WA20111206
Cruise Info: 27N Survey; SOOP_CO2
Geographical Region:
- Westernmost Longitude: -80.2
- Easternmost Longitude: -79.1
- Northernmost Latitude: 27.1
- Southernmost Latitude: 25.7

Cruise Dates (YYYYMMDD)
- Start_Date: 20111206
- End_Date: 20111207

Ports of Call:
- Miami, FL

Vessel Name: F.G. Walton Smith
Vessel ID: 33WA
Vessel Owner: University of Miami

Variables Information:

Variable Name: xCO2_EQU_ppm
Description of Variable: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_ppm
Description of Variable: Mole fraction of CO2 measured in dry outside air (ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_interpolated_ppm
Description of Variable: Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)
Unit of Variable: ppm

Variable Name: PRES_EQU_hPa
Description of Variable: Barometric pressure in the equilibrator headspace (hectopascals)
Unit of Variable: hPa

Variable Name: PRES_ATM@SSP_hPa
Description of Variable: Barometric pressure measured outside, corrected to sea level (hectopascals)
Unit of Variable: hPa

Variable Name: TEMP_EQU_C
Description of Variable: Water temperature in equilibrator (degrees Celsius)
Unit of Variable: Degree C

Variable Name: SST_C
Description of Variable: Sea surface temperature (degrees Celsius)
Unit of Variable: Degree C

Variable Name: SAL_permil
Description of Variable: Sea surface salinity on Practical Salinity Scale (permil)
Unit of Variable: ppt

Variable Name: fCO2_SW@SST_uatm
Description of Variable: Fugacity of CO2 in sea water at SST and 100% humidity (microatmospheres)
Unit of Variable: µatm

Variable Name: fCO2_ATM_interpolated_uatm
Description of Variable: Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (microatmospheres)
Unit of Variable: µatm

Variable Name: dfCO2_uatm
Description of Variable: Sea water fCO2 minus interpolated air fCO2 (microatmospheres)
Unit of Variable: µatm

Variable Name: WOCE_QC_FLAG
Description of Variable: Quality control flag for fCO2 values (2=good, 3=questionable)
Unit of Variable: None

Variable Name: QC_SUBFLAG
Description of Variable: Quality control subflag for fCO2 values, provides explanation when QC flag=3
Unit of Variable: None

Method Description:

Equilibrator Design:

Depth of Seawater Intake: 1.5 meters
Location of Seawater Intake: Bow
Equilibrator Type: Sprayhead above dynamic pool, with thermal jacket
Equilibrator Volume: 0.95 L (0.4 L water, 0.55 L headspace)
Water Flow Rate: 1.5 - 2.0 L/min
Headspace Gas Flow Rate: 70 - 150 ml/min
Vented: Yes
Drying Method for CO2 in Water:
Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Additional Information: Primary equilibrator is vented through a secondary equilibrator

CO2 in Marine Air:

Measurement: Yes, 5 readings in a group every 4 hours
Location and Height: Mast above the bridge, ~13 meters above sea surface
Drying Method:
Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

CO2 Sensor:
Measurement Method: Infrared absorption of dry sample gas
Manufacturer: LI-COR
Model: 6262
Frequency: Every 140 seconds, except during calibration
Resolution Water: 0.01 microatmosphere
Uncertainty Water: ± 1 microatmospheres
Resolution Air: 0.01 ppm
Uncertainty Air: ± 0.2 ppm
Manufacturer of Calibration Gas:
Airgas, Inc. - Std 1: 202.52 ppm / Std 2: 391.28 ppm / Std 3: 628.67 ppm / Std 4: 1479.07 ppm
Number of Non Zero Gas Standards: 4
CO2 Sensor Calibration:
The analyzer is calibrated every 4 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale.
Other Comments:
Instrument is located in an air-conditioned laboratory.
Method References:
Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations for autonomous underway pCO2 measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.
Details Co2 Sensing:
details of CO2 sensing (not required)
Measured Co2 Params:
xco2(dry)

Sea Surface Temperature:

Location: After sea water pump
Manufacturer: Seabird
Model: SBE-38
Accuracy Degrees Celsius: 0.001
Precision Degrees Celsius: 0.00025
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Equilibrator Temperature:
Location: Inserted into equilibrator ~5 cm below water level
Manufacturer: Hart
Model: 1523
Accuracy Degrees Celsius: 0.015
Precision Degrees Celsius: 0.001
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision.

Equilibrator Pressure:
Location: Attached to equilibrator headspace
Manufacturer: Setra
Model: 239
Accuracy hPa: 0.052
Precision hPa: 0.01
Calibration: Factory calibration
Comments:
Differential pressure reading from Setra-239 attached to the equilibrator headspace was added to the pressure reading of the analyzer to yield the equilibrator pressure. Manufacturer's Resolution is taken as Precision.

Atmospheric Pressure:
Location: On mast above the bridge at ~13 m above the sea surface water
Manufacturer: R.M. Young
Model: 61302
Accuracy: ± 0.3 hPa
Precision: 0.1 hPa
Calibration: Factory calibration
Normalized: yes
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Sea Surface Salinity:
Location: In dry lab
Manufacturer: Seabird
Model: SBE 45
Accuracy: ± 0.005 permil
Precision: 0.0002 permil
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Additional Information:

No data was available from the ship's sensors for the last hour of pCO2 data. A salinity of 35 psu was assigned for this interval. The missing SST values were estimated by subtracting 0.92 from the equilibrator temperatures. For 778 analyses with complete data records, the average difference between the equilibrator and SBE38 temperatures was 0.92 (+/-0.11) degree Celsius. The LICOR pressure transducer operated poorly,

and the atmospheric pressure recorded by the ship had a resolution of 1 mbar. The atmospheric and LICOR pressures were estimated from the average of barometer readings on five buoys in the Florida Bay region.

Preliminary Quality Control:

NA

Form Type:

underway